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ATTACHMENT 5A: ARCHITECTURAL MATERIAL QUALITY AND DURABILITY REQUIREMENTS

5A.1 ACRONYMS

The following acronyms are used throughout Attachment 5A:

AA	Aluminum Association
AADAF	Aluminum Association Designation System for Aluminum Finishes
ACI	American Concrete Institute
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CABO	Council of American Building Officials
CFR	Code of Federal Regulations
DFPA	Defense Fire Protection Association
DHI	Door and Hardware Institute
FBS	Federal Bureau of Standards
FGMA	Flat Glass Marketing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
HPVA	Hardwood Plywood and Veneer Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NEMA	National Electrical Manufacturers Association
NFPA	National Forest Products Association

NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWWDA	National Wood and Door Manufacturers Association
OSHA	Occupational Safety & Health Administration
SCS	Scientific Certification Systems
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Painting Council
TCA	Tile Council of America, Inc.
UL	Underwriters Laboratories, Inc.

The following materials are listed and described to set minimum quality and durability requirements.

5A.2 MASONRY

5A.2.1 Codes and Standards

Conform to the following minimum codes and standards:

- ASTM A 36 - Carbon Structural Steel, Standard Specification for
- ASTM A 82 - Steel Wire, Plain, for Concrete Reinforcement
- ASTM A 153 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Steel and Strip, Standard Specification for
- ASTM A 240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels, Standard Specification for
- ASTM A 366 - Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality, Standard Specification for
- ASTM A 569 - Steel, Carbon (0.15 Maximum Percant), Hot-Rolled Sheet and Strip, Commercial Quality, Standard Specification for.
- ASTM A 580 - Stainless Steel Wire, Standard Specification for
- ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, Standard Specification for
- ASTM A 663 - Steel Bars, Carbon, Merchant Quality, Mechanical Properties, Standard Specification for
- ASTM D 2240 - Rubber Property – Durometer Hardness, Standard Test Method for
- ACI 315 - “Manual of Standard Practice for Detailing Reinforced Concrete Structures”
- ASTM C 5 - Quicklime for Structural Purpose

- ASTM C 90 - Specification for Load-Bearing Concrete Masonry Units
- ASTM C 91 - Masonry Cement
- ASTM C 136 - Sieve or Screen Analysis of Fine and Coarse Aggregates
- ASTM C 140 - Sampling and Testing Concrete Masonry Units, Standards Test Methods
- ASTM C 144 - Aggregate for Masonry Mortar
- ASTM C 145 - Solid Load-Bearing Concrete Masonry Units
- ASTM C 150 - Portland Cement
- ASTM C 180 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Masonry Units
- ASTM C 207 - Hydrated Lime for Masonry Purpose
- ASTM C 216 - Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale)
- ASTM C 270 - Mortar for Unit Masonry
- ASTM C 331 - Lightweight Aggregate for Concrete Masonry Units, Standard Specification for
- ASTM C 404 - Aggregate for Masonry Grout
- ASTM C 426 - Linear Drying Shrinkage of Concrete Masonry units, Standard Test Method for
- ASTM C 476 - Grout for Masonry
- ASTM C 744 – Prefaced Concrete and Calcium Silicate Masonry Units, Standard Specification for
- ASTM C 1019 - Standard Test Method of Sampling and Testing Grout
- ASTM E 84 - Surface Burning Characteristics of Building Materials, Standard Test Methods for
- ASTM E 119 - Fire Test of Building Construction and Materials, Standard Test Methods for
- ACI-530/ASCE 5 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures
- ACI-530.1/ASCE 6 - Specifications for Masonry Structures
- UL design Numbers U901 through U914

5A.2.2 Quality Assurance

Structural masonry elements shall conform to the latest edition of requirements of AC1 530/ASCE 5 for materials and installation. Masonry materials and installation shall conform to the requirements of the latest edition of ACI 530.1/ASCE 6.

Prior to initiating construction of masonry, prepare for the City's review and approval a composite sample panel, including all exterior materials, where the separate materials meet each other and a corner condition that clearly indicates texture, color, bond pattern, mortar color, tooled joints, insulation, reinforcing and backup. The sample panel shall be

eight feet long and eight feet high. Demolish sample panel after the masonry structure has been completed.

5A.2.3 Materials

Concrete masonry units shall be manufactured with lightweight aggregate and conform to the following requirements:

- Hollow Load-Bearing Units: ASTM C 90, Type I. Provide for exterior walls, interior load-bearing and nonload-bearing walls and partitions.
- Solid Load-Bearing Units: ASTM C 90, Type I, except units exposed to weather shall be Grade U. Provide solid units for masonry bearing under structural framing members and for fireproofing of steel structural members.
- Special Shapes: Provide special shapes, such as closures, header units, and jamb units as necessary to complete the work, and have them conform to the applicable provisions for the units with which they are used.
- Face Brick: ASTM C 216 Grade SW Type FBS.
- Limestone: Select Grade limestone from a quarry producing a product that has been tested at the National Bureau of Standards for physical properties and weathering, and that is free from all defects which would impair its strength, durability or appearance. Cut stone accurately, true and square to required shape and dimensions with all projecting members having a deep drip. Cut holes and sinkages for all anchors, cramps, dowels and other accessories.

Metal Accessories: Provide hot-dipped galvanized metal accessories conforming to ASTM A 153, Class B2 that are galvanized after cutting and as required to secure masonry to adjoining construction for interior walls and partitions. Provide Type 304 stainless steel metal accessories for exterior walls. Conform deformed reinforcing bars to ASTM A 615 Grade 60.

Weep Holes: Provide clear polyethylene, medium density plastic, rectangular tubes.

Anchors, Cramps and Dowels for Stone: Type 304 stainless steel.

Flexible Flashings: Minimum 5-ounce copper with glass fabric that is not affected by age. Provide a mastic sealant as recommended by the membrane manufacturer for sealing laps.

5A.3 METAL FABRICATIONS

5A.3.1 Codes and Standards

Minimum codes and standards:

- ASTM A 36 - Structural Steel

- ASTM A 123 - Standard Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products
- ASTM A 153 - Standard Specification for Zinc (Hot-Dip) Coatings on Iron and Steel Hardware
- ASTM A 193/A193M Grade MT316 - Stainless Steel Bolts
- ASTM A 283/A283M - Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
- ASTM A 320 - Standard Specification for Alloy Steel Bolting Material for Low Temperature Service
- ASTM A 554 - Welded Stainless Steel Mechanical Tubing
- ASTM B 137 - Method for Measurement of Mass of Coating on Anodically Coated Aluminum
- ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- ASTM B 211 - Standard Specification for Aluminum and Aluminum-Alloy Bars, Rod and Wire
- ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rod, Wire, Shapes and Tubes
- ASTM B 244 - Method for Measurement of Thickness of Anodic Coatings on Aluminum and Other Nonconductive Coatings on Nonmagnetic Basic Metals with Eddy-Current Instruments
- FS FF-S-325 - Expansion Shields for Masonry Anchorage
- FS FF-B-588 - Toggle Bolts
- ANSI A14.3 - Safety Requirements for Fixed Ladders
- AWS D1.1 - Structural Welding Code

5A.3.2 Materials

Metal items shall meet the requirements of the following minimum standards:

Structural steel, shapes and plates, except plates to be bent or cold-formed	ASTM A 36/A36M
Steel plates, bent or cold-formed	ASTM A 283/A283M, Grade C
Steel bars and bar size shapes	ASTM A 36/A36M
Sheet aluminum and extrusions	As required for color (3003 Alloy with mill finish)
Aluminum castings thresholds and the like ornamental	Alloy 356-T6 or Alloy 214-F
Aluminum screw machine parts	Alloy 2024-T4
Structural aluminum	Alloy 6061-T6
Aluminum bar	Alloy 6061-T6511

Stainless steel sheet	U.S. Steel 16-10, Grade MT316
Pipe, stainless steel	ASTM A 554 Grade MT304
Bolts: stainless steel	ASTM A 193/A193M, Grade MT316

Lead expansion anchors for concrete shall meet the requirements of FS FF-S-325, wedge type, Group II, Type 4, Class 1 or 2; self-drilling type, Group III, Type I or nondrilling type, Group VIII, Type 1 or 2.

Bolt anchor expansion shields for masonry shall meet the requirements of FS FF-S-325, lag shield type, Group II, Type I, or split shield type, Group II, Type 3, Class 3.

Expansion bolts shall be of Grade 316MT stainless steel.

The gauges specified refer to U.S. Standard gauge for sheet steel, plate iron and steel, and to Brown & Sharp Gauge for wire and sheet aluminum.

Screws, bolts, nuts and similar items used in connection with galvanized exterior work shall be stainless steel.

Anodically treat aluminum to meet the test requirements of ASTM B 137 for weight and ASTM B 244 for thickness.

Nosings: Provide nonslip nosings on all interior stairs that are 4 inches wide and 6 inches less in length than the length of the tread and of cast abrasive aluminum No. 101. Finish the top surface flush with the cement finish. Install nonslip nosings at the edge of each interior stair landing and platform. Provide a minimum of three anchors to each nosing.

Ladders: Ladders shall comply with the latest edition of OSHA and ANSI A14.3 requirements.

Ladder Safety Post: Install a ladder safety post at the top of all fixed ladders and cast-in ladder rungs below floor and sidewalk doors and roof hatches. Provide the device manufactured of high-strength galvanized steel and include a telescoping section that locks automatically when fully extended. Control upward and downward movement by a spring balancing mechanism with the spring of a special corrosion-resistant alloy. Assemble the unit completely and install it in strict accordance with the manufacturer's instructions.

Thresholds: Provide thresholds for door openings of cast abrasive aluminum, and extruded aluminum, unless otherwise shown or specified.

Aluminum Finishes: Provide aluminum finishes specified below in strict compliance with the National Association of Architectural Metal Manufacturers (NAAMM) aluminum finish designations, as a minimum standard. Provide aluminum finishes as follows:

Exterior aluminum items, unless otherwise specified: NAAMM Architectural Class 1, AA-A41 clear coating.

Interior aluminum items, unless otherwise specified: NAAMM Architectural Class 2, AA-A31 clear coating.

Stainless Steel Finish: Provide stainless steel with a No. 4 satin finish unless otherwise shown.

5A.3.3 Fabrication

General: Form all work true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, and free from defects impairing strength or durability. Precision fitting and jointings are required for all work. Perform all welding in a way to prevent pitting or discoloration.

Welding: Weld joints of such character and assemble so that they will be as strong and rigid as the adjoining section. Select wire for welding to prevent discoloration and to insure sound structural welds. Continuously weld exposed joints their entire length unless otherwise shown or specified. Provide all exposed welded face joints dressed flush and smooth.

Surface Flaws: Remove surface flaws on aluminum before the anodic coating is applied.

Miscellaneous: Perform all drilling, tapping, cutouts, and reinforcement required to attach, insert or fit thereto, fixtures and fittings in accordance with the drawings templates or instruction for the fixtures and fittings. Do not begin fabrication of metalwork until all drawings, templates or instructions are available.

5A.4 METAL STAIRS

5A.4.1 Codes and Standards

Minimum codes and standards:

- ASTM A 36/A36M - Structural Steel
- ASTM A 123 - Galvanizing
- ASTM A 193/A193M - Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service

- ASTM B 308/B308M - Aluminum - Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded
- AWS D1.1 - Structural Welding Code - Steel
- FF-5325 - Expansion Shields
- NAAMM - Metal Stair Manual and Metal Finishes Manual
- Aluminum Association Specification for Aluminum Structures

5A.4.2 Design Requirements

Fabricate aluminum and steel stairs, ships ladders and stile assemblies to support the required live load with a deflection of the stringers or landing framing not to exceed L/240 of the span.

5A.4.3 Materials

Steel Sections: ASTM A 36/A36M steel sections including: stringers, headers, tees, carrier angles, clip angles, angles, bracing, stiffeners, supports, and bearing plates.

Aluminum Sections: ASTM B 308/B308M aluminum sections including: stringers, headers, tees, carrier angles, clip angles and angles, bracing, stiffeners, supports and bearing plates.

Aluminum Plates: ASTM B 209 aluminum riser.

Stair Treads: Abrasive cast aluminum.

Stair Platforms and Landings: Abrasive cast aluminum, with truss ribs, and toeplates and nosings, matching the treads.

Stile and Ships Ladder Treads: Treads of abrasive cast aluminum 1/2-inch thick.

Welding Materials: Provide AWS D1.1 welding for type required for materials being welded.

Expansion Bolts: ASTM A 193/A193M expansion bolts with washers and nuts, stainless steel type.

5A.4.4 Fabrication

General: Fit and shop assembly the stairs, ships ladders, platforms and stiles in the largest practical sections for delivery to the job site.

Stringers: Miter the stringers at changes in direction with joints tightly fitted and secured by continuous welds. Grind all exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight. Ease exposed edges to a small uniform radius.

Fasteners: Use Type MT 316 stainless steel complying with ASTM A 193/A193M for fastening treads to the carrier angles and for expansion bolts. Provide closed-end, bottom bearing expansion shields in accordance with the requirements of FF-B-5325.

5A.4.5 Finishes

Provide aluminum stairs, ships ladders, and stiles, excluding treads and platforms, with a NAAMM, Architectural Class II, AA-C22A31, clear natural coating for interior use and Architectural Class I, AA-C22A41, clear natural coating for exterior use.

5A.5 HANDRAILS AND RAILINGS

5A.5.1 Codes and Standards

Minimum codes and standards:

- ASTM B 26 - Aluminum-Alloy Sand Castings
- ASTM B 210 - Aluminum-Alloy Drawn Seamless Tubes
- ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
- ASTM B 241/B241M - Specification for Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
- ASTM B 247 - Aluminum-Alloy Die and Hand Forgings
- ASTM B 429 - Aluminum-Alloy extruded Structural Pipe and Tube
- ASTM A 554 - Specification for Welded Stainless Steel Mechanical Tubing
- OSHA Part 1910.23 - Guarding Floor and Wall Openings and Holes
- AWS D10.7 - Gas Shielded-Arc Welding of Aluminum and Aluminum-Alloy Pipe
- The Aluminum Association, Aluminum Standards and Data: and Standards for Anodized Architectural Aluminum
- NAAMM, Metal Finish Manual
- NAAMM, Pipe Railing Manual
- ANSI A12.1, Safety Requirements for Floor and Wall Openings, Railings and Toeboards
- Standard of the Reinforced Plastic/Composites Institute
- National Bureau of Standards, PS 15-69

5A.5.2 System Description

Fabricate and install the railing or handrail assembly to meet or exceed OSHA standards.

5A.5.3 Materials

Fabricate stainless steel railings and posts of nominal 1-1/2-inch Schedule 5 stainless steel pipe conforming to ASTM A 554-MT316 and fabricate aluminum railings and posts

of 1-1/2-inch Schedule 40 aluminum pipe conforming to ASTM B 241/B241M, 6063-T6. Fabricate railings and posts in high corrosive interior areas of Fiber Reinforced Plastic. Finish stainless steel pipe with a 180-grit finish. Finish exterior and interior aluminum pipe railings with a NAAMM Architectural Class I AA-A41 clear coating.

5A.6 ROUGH CARPENTRY

5A.6.1 Codes and Standards

Minimum codes and standards:

- ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
- FS TT-W-571 - Wood Preservation Treating Practices
- AWPA - American Wood Preservers Association - Type A, Interior Fire Retardant Treated Lumber and Plywood
- NFPA - National Forest Products Association, National Design Specification for Wood Construction
- American Lumber Standard Committee, National Grading Rule for Dimension Lumber, PS-20
- American Wood Preserves Association, Standard C-2
- Occupational Safety and Health Act of 1972
- West Coast Lumber Inspection Bureau, Grading Rules
- American Wood Preservers Association, M4
- Federal Specification, TT-W-550, Wood Preservative: Chromated Copper Arsenate Mixture

5A.6.2 Materials

General: Provide lumber for rough carpentry such as nailers, grounds, blocking and framing of Construction Grade, thoroughly seasoned dry No. 1 white fir, ponderosa pine, spruce or hem-fir.

Preservative Treatment: Pressure treat all lumber for rough carpentry which is incorporated into the finished structures. Provide pressure-treated lumber complying with the requirements established in the latest AWPA P5 and TT-W-571. Use water-borne preservative with 0.25 percent retainage. Brand all lumber accordingly.

Fire Retardant Treatment: Pressure-impregnate all wood designated to be fire-retardant treated with a flameproofing complying with the requirements of AWPA Type A and with U.L., Inc. requirements for flame spread of 25 or less with no evidence of significant progressive combustion when tested in accordance with ASTM E 84. Provide each piece

of wood bearing the U.L., Inc. FRS Label or the U.L., Inc. label indicating complete compliance with the fire hazard classification.

Code Conformance: Provide materials conforming to the requirements of the National Design Specification for Stress Grade Lumber as recommended by the National Forest Products Association.

Product Standards: Provide plywood conforming to the requirements of the American Plywood Association.

Grading: Provide each panel of plywood identified with the appropriate DFPA grade mark of the American Plywood Association.

Exterior Plywood Uses: Provide exterior type plywood where plywood used for roof sheathing or decking or in areas where it may be exposed to moisture.

Temporary Protection: Provide exterior type southern yellow pine plywood for temporary protection, APA Grade C, plugged fir.

5A.6.3 Accessories

Provide anchors, connectors, and fastenings, of the type, size and spacing necessary to suit the conditions encountered and as recommended by National Forest Products Association.

Provide Zinc-electroplated steel rough hardware exposed to the weather. Provide zinc-electroplated steel bolts, nuts, washers, hangers, and straps, and for all other rough hardware embedded in, or in contact with exterior walls or slabs, and located in humid areas.

Form and punch rough hardware before coating. Use common steel wire nails, bright finish, unless specified otherwise. Provide bolt heads and nuts bearing on wood with standard steel washers. Provide galvanized fasteners for treated wood.

5A.7 BOARD INSULATION

5A.7.1 Environmental Requirements

Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

5A.7.2 Materials

Polystyrene Insulation: Provide materials meeting ASTM C 578 Type IV extruded cellular type, conforming to the following:

- Thermal Resistance: R @ 75 F - 10.0
- Thickness: 2 inch minimum thickness
- Board Size: 16 x 96-inch
- Compressive Strength: Minimum 25 psi
- Water Absorption: In accordance with ASTM C 272, 0.15 percent by volume maximum
- Edges: Square
- Adhesive: Provide adhesive type as recommended by insulation manufacturer for this application
- Caulking Compound: Provide latex or silicone type as recommended by the insulation manufacturer

5A.8 ROOFING

5A.8.1 Codes and Standards

Minimum codes and standards:

- FM - Roof Assembly Classifications
- UL - Fire Hazard Classifications

5A.8.2 Submittals

Warranties: Submit a copy of each warranty to the City.

5A.8.3 System Description

Provide roofing system most appropriate for the project. Metal roofs shall not be used for Finished Water Reservoirs. The specific roofing systems to be employed for each building are identified in Attachment 5D to Appendix 5.

5A.8.4 Warranty

For all roofing systems, the Company shall provide a written total system warranty, without monetary limitation, in which the manufacturer agrees to repair or replace all components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks. The warranty shall include all of

the components and accessories of the designed roofing system. The warranty period shall be a minimum of 20 years from the date of Substantial Completion.

5A.8.5 Regulatory Requirements

Conform to applicable code for roof assembly fire hazard requirements. Provide all roofing materials with a UL and FM Class A Fire Hazard Classification.

5A.9 SHEET METAL FLASHING AND TRIM

5A.9.1 Codes and Standards

Minimum codes and standards:

- ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- ASTM B 29 - Pig Lead
- ASTM B 32 - Solder Metal
- ASTM B 117 - Salt Spray (F06) Testing
- FS O-F-506C - Flux, Soldering, Paste and Liquid
- FS SS-C-153 - Cement, Bituminous, Plastic
- ASTM D 226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- ASTM D 2822 - Specification for Asphalt Roof Cement
- SSPC - Paint 12, Specification for Cold-Applied Solvent Type Bituminous Mastic Coating
- SMACNA - Architectural Sheet Metal Manual
- NRCA - Roofing and Waterproofing Manual

5A.9.2 Materials

Provide 0.015-inch fully annealed Type 304 stainless steel sheet metal, conforming to ASTM A 167, coated with (ZT) and as manufactured for building construction.

5A.9.3 Accessories

Provide accessories as follows:

- Anchors with fiber plugs with lead cores.
- Screws, anchor bolts, washers, and the like made of Type 316 stainless steel and of appropriate size to suit securement conditions.
- Flathead common Type 316 stainless steel nails of appropriate size, length and gauge for the intended securement conditions.
- Cleats of 26-gauge (.018-inch) zinc and tin alloy coated Type 304 stainless steel.

- Zinc/tin or pure tin solder of top quality as recommended by the sheet metal manufacturer.
- Plastic cement meeting the requirements of ASTM D 2822, Type 1.
- Reglets that are 28-gauge stainless steel.
- Asphalt-saturated felt weighing 15 pounds per 100 square feet conforming to the requirements of ASTM D 226.
- Building paper made of Rosin-sized, unsaturated paper weighing 30 pounds per 100 square feet.
- Split ring clamps constructed of the same material as the sheet metal flashing.

5A.10 JOINT SEALERS

5A.10.1 Codes and Standards

Minimum codes and standards:

- ASTM C 510 - Test for Staining and Color Change of Single of Multicomponent Join Sealers
- ASTM C 661 - Test for Indentation Hardness of Elastomeric-Type Sealers by Means of a Durometer
- ASTM C 793 - Test for Effect of Accelerated Weathering on Elastomeric Joint Sealers
- ASTM C 920 - Elastomeric Joint Sealants
- Federal Specification, FS TT-S-00227E - Sealing Compound: Elastomeric Type, Multi-component for Calking, Sealing and Glazing in Building and other Structures
- Federal Specification, FF TT-S-001543 - Sealing Compound, Silicone Rubber Base (for Calking, Sealing and Glazing in Building and Other Structures)
- Thiocol Chemical Corporation, Standards for Polysulfide Sealants

5A.10.2 Materials

Provide sealant based on liquid polyurethane polymer. Deliver the sealant to the job site in sealed containers bearing the manufacturer's name and product designation. Provide a two component elastomeric sealant conforming to ASTM C 920, Type M, Grade NS, Class 25.

5A.10.3 Accessories

Primer (where required): Provide primer of the nonstaining type, recommended by sealant manufacturer to suit the application. Test the primer for staining and durability on samples of the actual surface to be sealed.

Backup Materials: Provide nonstaining backup materials and preformed joint fillers, compatible with sealant and primer, and of a resilient nature, such as closed cell polyethylene rod, closed cell urethane or neoprene rod, or elastomeric tubing or rod. Do not use materials impregnated with oil, bitumen or similar materials. Do not allow sealant to adhere to the backup material.

Bond Breakers: Provide bond breakers, where required, of polyethylene tape.

Solvents: Provide solvents and cleaning agents compatible with the caulking compound, backup material and bond breakers.

Manufacturers' Recommendations: Provide primer, backup materials, bond breakers and solvents recommended by the sealant manufacturer in writing.

5A.11 STEEL DOORS AND FRAMES

5A.11.1 Codes and Standards

Minimum codes and standards:

- ASTM A 153 - Zinc Coating on Iron and Steel Hardware
- ASTM A 366 - Carbon Steel Cold-Rolled Sheet
- ASTM A 525 - Steel Sheet, Galvanized by the Hot-Dip Process - General
- ASTM A 526 - Steel Sheet, Galvanized by the Hot-Dip Process - Specifications
- ASTM A 568 - Carbon Steel and High Strength Low Alloy Hot Rolled Sheet, Hot Rolled Strip and Cold-Rolled Sheet
- ASTM A 569 - Steel, Carbon Hot-Rolled Sheet and Strip
- ASTM 152 - Fire Tests of Door Assemblies
- Steel Door Institute Standard Steel Doors and Frames
- ANSI A 115 - Specification for Door and Frame Preparations for Hardware
- NFPA 80 - Standard for Fire Doors and Windows
- NFPA 252 - Fire Tests of Door assemblies
- UL10(b) - Fire Tests of Door assemblies
- UL 63 - Fire Door Frames
- UL Building Materials Directory
- National Association of Architectural Metal Manufacturers (NAAMM), Hardware Location for Custom Hollow Metal Doors

5A.11.2 Materials

Door Faces and Frames: Zinc-coated, cold-rolled carbon steel sheets of commercial quality, complying with ASTM A 366 and ASTM A 653, G 60 zinc coating, mill-phosphatized.

Supports and Anchors: Sheet metal, hot-dip galvanized after fabrication.

Inserts, Bolts and Fasteners: Sheet metal hot-dip galvanized.

5A.11.3 Fabrication

Frames: Fabricate frames of full-welded unit construction, with corners mitered, reinforced, continuously welded full depth and width of frame with exposed welds ground flush and smooth.

Fabricate hollow metal units to be rigid, neat in appearance and free of defects, warp or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the project site. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Use of filler to conceal manufacturing defects is not acceptable.

Provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115, Specifications for Door and Frame Preparation for Hardware. Drilling and tapping for surface-applied finish hardware may be done at the site.

Reinforce hollow metal units to receive surface-applied and recessed finish hardware.

Doors: Provide flush design doors, 1-3/4-inches thick, seamless hollow construction. Fabricate doors of two outer stretcher-leveled steel sheets galvanized with a G60 zinc coating of 0.60 ounces per square foot in accordance with ASTM A 525 and A 526 and not less than 16 gage. Construct doors with smooth, flush surfaces without visible joints or seams or exposed faces or stile edges, except around glazed or louvered panel inserts. Provide continuously welded seams for all door construction. No fillers shall be used.

5A.12 ALUMINUM DOORS AND FRAMES

5A.12.1 Codes and Standards

Minimum codes and standards:

- AADAF-45 - Aluminum Association Designation System for Aluminum Finishes

- ASTM A 103 - Zinc (hot-galvanized) Coating on Product Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars
- ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
- ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- ASTM B 509 - Cellular Elastomeric Performed Gasket and Sealing Material
- ASTM D 2000 - Classification for Elastomeric Materials for Automotive Allications
- ASTM D 2287 - Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
- NAAMM - Hardware Location for Custom Hollow Metal Doors
- NAAMM - Metal Finish Manual
- SSPC - Paint 12, Cold Applied Asphalt Mastic (Extra Thick Film)
- Aluminum Association (AA), Standard and Finish Designation
- ANSI A 115 - Specification for Door and Frame Preparation for Hardware
- Architectural Aluminum Manufacturing Association 701.1 - Standard for Sliding Weatherstripping

5A.12.2 Materials

Provide commercial quality 6063-T5 extruded aluminum conforming to ASTM B221 for doors, frames and transoms. Provide 5005-H14 aluminum for door face sheets. Provide all aluminum conforming to ASTM B209 meeting the requirements of NAAMM for the finish specified.

5A.12.3 Fabrication

General: Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

Joints and Corners: Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

Aluminum and Glass Doors: Provide wide stile doors made of extruded aluminum tubular sections having walls not less than 1/8-inch thick and with hairline joints. Fasten top and bottom rails with 3/8-inch diameter steel tension rods fixed at the ends with stainless steel tension plates and locknuts. Provide cross webs at the top and bottom rails not less than 0.188-inch thick for hardware attachments. Provide snap-in type glazing members at all doors.

Flush Panel Doors: Construct flush type doors of tubular extrusions and .090-inch thick smooth finish face sheets. Do not cap door edges with any distorting or protruding channels. Conform to minimal member thickness:

Lock or hinge rail edge	0.220-inch
Internal grid members	0.080-inch

Construct doors with tops and bottoms reinforced with tubular sections. Weld a similarly sized cross rail across the center of the door.

Construct doors with an internal grid system comprised of tubular sections spaced horizontally at no less than 24 inches apart. Reinforce cut out with the same members. Fill all voids in the doors between the grid sections with specified soundproofing insulating material. Bond face sheets to the rim, grid sections and insulation with a thermal setting epoxy adhesive. The Company shall provide an unconditional written guarantee of the adhesion for the life of the doors.

Transom Panels: Construct transom panels the same as the doors.

Frames: Construct frames of extruded aluminum with walls not less than 1/8-inch thick and suitable for weather stripping. Reinforce doors and the head and jamb sections for door frames for specified hardware. Reinforce the head and jamb sections of doors greater than 3 feet wide with 3/8-inch thick stainless steel.

5A.12.4 Finishes

General: Finish all aluminum doors and frames with a color anodic finish.

Clear anodize all internal members of flush panel doors.

Special Coating: Apply bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

Finishes: Provide Architectural Class II, AA-C22.A31 clear coating for interior doors and a Class I, AA-C22A41 clear coating for exterior doors.

5A.13 STAINLESS STEEL DOORS AND FRAMES

5A.13.1 Codes and Standards

Minimum codes and standards:

- ASTM A 153, Zinc Coating on Iron and Steel Hardware.

- ASTM A 167, Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- ASTM A 176, Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.
- ASTM A 453, Bolting Materials, High-Temperature, 50 to 120 ks; Yield Strength, with Expansion Coefficients Comparable to Austenitic Steels.
- ANSI A115, Specifications for Door and Frame Preparation for Hardware.
- Steel Door Institute Standard Steel Doors and Frames.

5A.13.2 Materials

Door Faces, Frames and All Internal Sub-Core Sheet and Stiffeners: AISI Type 316 stainless steel complying with ASTM A 167, with uniform fine glass bead-blasted finish on all external materials.

Supports and Anchors: Sheet metal, Type 316 stainless steel, complying with ASTM A 176, Class B.

Inserts, Bolts and Fasteners: Type 316 stainless steel complying with ASTM A 453.

5A.13.3 Fabrication

Fabricate frames of full-welded unit construction, with corners mitered, reinforced, continuously welded full depth and width of frame with exposed welds ground flush and smooth. Gage thickness of stainless steel shall not be less than 12.

Fabricate hollow metal units to be rigid, neat in appearance and free of defects, warp or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the project site. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Use of filler to conceal manufacturing defects is not acceptable.

Provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115, Specifications for Door and Frame Preparation for Hardware. Drilling and tapping for surface-applied finish hardware may be done at the site.

Reinforce units to receive surface-applied and recessed finish hardware.

Doors: Provide flush design doors, 1-3/4-inches thick, seamless hollow construction. Fabricate doors of two outer stretcher-leveled stainless steel sheets not less than 18 gauge Type 316 stainless steel with uniform No. 4 finish. Construct doors with smooth, flush surfaces without visible joints, seams or weld marks on exposed faces or stile edges. Provide seam on door edge continuously tig welded full height of door. Reinforce inside of doors with 18 gauge stainless steel stiffeners spaced 6-inches apart and continuously welded to 16 gauge stainless steel sub-core skin 4-inches on center. Sound deadening, heat retarding, 17-pound density mineral coreboard with 100 psi minimum compressive strength at 10 percent deformation shall be solidly packed between the stiffener plates and shall extend for the entire height and width of the door. All metal used in the construction of the door shall be stainless steel.

5A.14 WOOD DOORS AND FRAMES

5A.14.1 Codes and Standards

Minimum codes and standards:

- ASTM E329 - Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ANSI in association with Door and Hardware Institute, ANSI/DHI A-115-W, (A115.W1-A115.W9), Wood Door Prep Standards
- ANSI A208.1 - Particleboard
- ANSI/NFPA 252 - Fire Tests of Door Assemblies
- NFPA 80 - Standard for Fire Doors and Fire Windows
- Architectural Woodwork Institute, AWI, Architectural Woodwork Quality Standards
- Door and Hardware Institute, DHI-WDHS-3, Recommended Hardware Locations for Wood Flush Doors
- Window and Door Manufacturers Association, ANSI/NWWDA I.S.1-A, Architectural Wood Flush Doors
- Hardwood Plywood and Veneer Association, HPVA HP-1, American National Standard for Hardwood and Decorative Plywood
- Public Law 101-36, The Americans with Disabilities Act of 1990, Title 28, Appendix A, Code of Federal Regulations Part 36, Accessibility Guidelines for Buildings and Facilities - ADAAG
- Forest Stewardship Council, FSC, Principles and Criteria for Forest Certification
- Rain Forest Alliance, SmartWood Program
- Scientific Certification Systems, Incorporated, SCS, Forest Conservation Program

5A.14.2 Materials

Frames: Zinc-coated, cold-rolled carbon steel sheets of commercial quality, complying with ASTM A 366 and ASTM A 653, G 60 zinc coating, mill-phosphatized.

Doors: Provide premium grade, solid core, veneer-faced, flush wood doors. Doors shall have a minimum thickness of 1-3/4-inches and be constructed of kiln-dried wood with 6-12 percent moisture, maximum.

Particleboard Core: Complying with ANSI A208.1, LD-2 minimum.

Mineral Core: Standard mineral core as required to meet fire-resistance-rating required by Applicable Law.

Adhesives shall meet performance criteria recommended by the manufacturer for hot-press fabrication.

Provide manufacturer's premium low-gloss satin factory-applied transparent finish.

5A.14.3 Fabrication

Preassemble and prepare all items in the shop to the greatest extent possible, so as to minimize field fabrication and assembly of units at the site. Prefit and pre-machine wood doors for finish hardware at the shop.

Top and bottom rails shall be hardwood in accordance with AWI standards, bonded to cores and of 3-inch minimum nominal size. Stiles shall be triple-ply laminated for all wood doors. Non-fire-resistance-rated wood doors shall be provided with glued block or structural composite lumber cores instead of particleboard cores at locations where exit devices are provided.

Doors shall be constructed of five plies with triple-ply stiles and rails bonded to core, all abrasive planed before veneering and with smooth, flush surfaces without visible joints or seams on exposed faces or edges, except around glazed inserts. No fillers shall be used.

Fire-resistance-rated interior flush wood doors shall have same face veneer and stile construction as non-fire-resistance-rated doors but shall be constructed using manufacturer's standard mineral core and with composite blocking for improved screw-holding capability and triple-ply stiles, as required to eliminate through-bolting of finish hardware.

Identify each fire-resistance-rated flush wood door and frame with recognized testing laboratory labels, indicating applicable fire-resistance-rating of both door and frame.

Wood transoms and side panels shall be provided of same construction, appearance of exposed surfaces and finish as door and shall be provided with concealed mounting brackets and fasteners.

5A.15 ACCESS DOORS

5A.15.1 Codes and Standards

Minimum codes and standards:

- ASTM B 209 - Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
- ASTM B 210 - Standard Specification for Aluminum and Aluminum Alloy Drawn Seamless Tubes
- ASTM B 221 - Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Shapes and Tubes
- NAAMM - Metal Finish Manual and Metal Box Grating Manual
- Aluminum Association Standard

5A.15.2 Materials

Sidewalk Doors: Provide sidewalk doors fabricated of aluminum with gutter and drain and stainless steel hardware. Provide doors that open 90 degrees, lock automatically and have slam lock and safety chains.

Floor Doors: Provide floor doors constructed of aluminum that have doors that open 90 degrees, lock automatically and have a slam lock.

Access Doors: Provide access doors with frames of a minimum of 16-gauge steel and doors a minimum of 14-gauge steel. Provide concealed spring type hinges opening to 170 degrees. Provide flush locks, screwdriver operated, with metal cam. Provide the frames and doors with a factory applied baked-on enamel prime coat chemically bonded to the steel and field painted to match.

5A.16 OVERHEAD COILING DOORS

5A.16.1 Codes and Standards

Minimum codes and standards:

- NAAMM - Metal Finishes Manual
- Aluminum Association (AA) Standard and Finish Designation
- National Electrical Manufacturers Association (NEMA), Standard, KS 1-1969

5A.16.2 Design Requirements

Design the door assembly to withstand wind/suction load of 30 psf, without undue deflection or damage to door or assembly components. Insulate the door for a R value of 8.62.

5A.16.3 Materials

Doors: Provide motor operated overhead coiling doors with thermal insulating system. Include hardware, operating mechanisms and weather protection features.

Electric Operators: Provide the electric motor of horsepower recommended by the manufacturer. Provide an emergency disconnect for manual operation. Provide electrical controls for the door, including a solenoid brake, interlock switch and limit switches and starter. Provide easily adjustable limit switches to stop doors at limits of travel.

5A.16.4 Fabrication

Form the curtain of interlocking slats of 16 gauge mill front and 22 gauge mill back aluminum #14 flat surface design. Equip the curtain with a heavy aluminum bottom bar consisting of two angles of equal weight, one on each side and a gasket seal securely fastened to the bottom of the curtain for reinforcement and to provide weather-tight contact against the sill when closed. Provide a bottom bar to act as a combination weather seal and safety device operating in conjunction with the door control to stop and reverse door if an obstruction is encountered.

5A.17 ALUMINUM WINDOWS

5A.17.1 Codes and Standards

Minimum codes and standards:

- NAAMM - Metal Finishes Manual
- ASTM A 123 - Coatings of Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips
- ASTM B 117 - Salt Spry (Fog) Testing
- ASTM B 136 - Stain Resistance of Anodic Coating on Aluminum
- ASTM B 137 - Weight of Coating on Anodically Coated Aluminum
- ASTM B 244 - Thickness of Anodic Coating on Aluminum with Eddy-Current Instruments
- ASTM C 542 - Lock-Strip Gaskets

- ASTM D 395 - Rubber Property-Compression Set
- ASTM D 412 - Rubber Properties in Tension
- ASTM D 523 - Specular Gloss
- ASTM D 573 - Rubber Deterioration in an Air Oven
- ASTM D 624 - Rubber Property – Tear resistance
- ASTM D 659 - Evaluating Degree of Resistance to Chalking of Exterior Paints
- ASTM D 746 - Brittleness Temperature of Plastic and Elastomers by Impact
- ASTM D 968 - Abrasion Resistance of Coatings of Paint, Varnish, Lacquer and related Products by the Falling Sand Method
- ASTM D 1149 - Rubber Deterioration – Surface Ozone Cracking in a Chamber
- ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- ASTM D 1737 - Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus
- ASTM D 2240 - Rubber Property-Durometer Hardness
- ASTM D 2244 - Color Differences of Opaque Materials
- ASTM D 2247 - Coated Metal Speciments at 100 Percent Relative Humidity
- ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
- ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- ASTM D 968 - Abrasion Resistance of Coatings of Paint, Varnish, Lacquer, and related Products by the Falling Sand Method
- FS, FF-S-92B - Screw, Machine: Slotted, Cross-recessed Or Hexagon Head
- Aluminum Association, Aluminum Standards and Data
- Aluminum Association, Designation System for Aluminum Finishes
- Aluminum Association, Standards for Anodized Architectural Aluminum
- NAAMM, FC-1, Field Check for Water Leakage of Metal Curtain Walls
- NAAMM, Metal Curtain Wall Specifications Manual
- NAAMM, Metal Finishes Manual
- SSPC, Systems and Specifications Surface Preparation Guide and Paint. Application Specification
- AWS, D10.7 - Recommended Practices for Gas Shielded-Arc Welding of Aluminum and Aluminum Alloy Pipe

5A.17.2 Design Requirements

Air infiltration: Provide windows having a maximum air infiltration of 0.10 cfm per foot of crack length at 6.24 psf pressure differential in accordance with ASTM E 283.

Water Resistance: Provide windows with no uncontrolled water leakage at 10.00 psf pressure differential with a water rate of 5 gallons/hr/sf when tested in accordance with ASTM E 331.

Uniform Load Deflection: Provide windows that will allow no glass breakage, permanent damage to fasteners, hardware, or damage to make windows inoperable or deflection in any unsupported span in excess of L/175 at the required positive and negative wind load when tested in accordance with ASTM E 330.

Thermal ("U" Value): Provide windows having a thermal transmittance ("U") maximum of .71 BTU/hr/sf/degree F at 15 mph exterior wind velocity.

5A.17.3 Materials

Structural Members: Provide extruded and sheet aluminum alloys compatible with the color finish specified.

Sealants: Provide sealants, tape, gaskets, and caulking materials as recommended by the window manufacturer and as approved.

Finishes: Provide finishes coordinated with the doors and louvers.

Fasteners: Provide all anchors, clips and bolts necessary to adequately secure windows, and other items of nonmagnetic stainless steel.

Compatibility: Provide stainless steel made of alloys, which are compatible with aluminum.

Screens: Provide screens at all operating sash with extruded tubular aluminum frames filled with 18 x 16 charcoal colored aluminum mesh and fastenings permitting easy attachment or removal from inside.

5A.17.4 Fabrication

General: Provide thermal-break windows with ventilators, screens and hardware.

Mullions: Provide mullions having a continuous thermal barrier and support to permit movement from expansion and contraction without damage to window assembly.

Weather Stripping: Provide weather stripping installed in retaining grooves designed as an integral part of the ventilator and continuous at corners.

Ventilators: Provide ventilators balanced on heavy-duty stainless steel and aluminum assemblies securely fastened with stainless steel screws. Do not bridge or violate the thermal barrier with hardware. Fit ventilators with cam-type locking handle in locations

of convenient reach. Provide close-type hinges of extruded aluminum alloy solidly welded to frames and vents.

5A.18 FINISH HARDWARE

5A.18.1 Codes and Standards

Minimum codes and standards:

- CABO A117.1 - Accessible and Usable Buildings and Facilities
- BHMA A156.1 - Butts and Hinges
- BHMA A156.2 - Bored and Preassembled Locks and Latches
- BHMA A156.4 - Door Controls and Closers
- NFPA80 - Fire Doors and Windows
- NFPA101 - Life Safety Code
- UL10B - Fire Tests of Door Assemblies
- UL305 - Panic Hardware
- FS TT-S-001657 - Sealing Compound - Single Component, Butyl Rubber Based, Solvent Release Type
- National Fire Protection Association, Standard for Fire Doors and Windows No. 80
- UL Building Materials Directory
- UL List of Inspected Fire Protection Equipment and Materials
- UL Hardware, Automatic Flush or Surface Bolts
- National Builders Hardware Association, Recommended Locations for Builders Hardware

5A.18.2 Keying

Key System: Provide door locks to be keyed in like-groups, keyed differently, master keyed, grandmaster keyed, including construction master keying, key to existing key system. When the buildings are completed, change the lock operations with the use of the construction master key in each cylinder.

Review the keying system with the City and provide the required type (master, grandmaster or great grandmaster).

Equip all locks with the 6-pin cylinders, removable, with removable core construction feature.

Key Numbering: Provide keys stamped with factory key numbers.

5A.18.3 Materials

Provide hardware needed for the Design/Build Work, meeting or exceeding the following standards of quality:

Hinges: Provide all doors with ball bearing heavy weight, full mortise hinges, five knuckles, made from stainless steel with nonremovable pins, meeting requirements in BHMA A156.1.

Hinge Size: Required hinge sizes for each door leaf are as follows:

Door Width (inches)	Hinge Size (inches)
36 or less	4-1/2 by 4-1/2
37 to 48	5 by 4-1/2
Over 48	6 by 4-1/2

Required number of hinges for each door leaf is as follows:

Door Height	Number of Hinges
5 feet or less	2
Over 5 feet to 7 feet 6 inches high	4
Over 7 feet 6 inches	5

Lock Type: Provide mortise type locks having heavy-gauge steel case, nonferrous where specified, and heavy-gauge steel fronts that are adjustable from flat to beveled. Provide reversible locks having true 3-piece, antifriction, hinged type, latch bolts with a minimum throw of 5/8 inch except as otherwise specified and required for U.L., Inc. labeled doors, and meeting the requirements of BHMA A156.2, Grade 2L for standard dimensions.

Dead Bolt Type: Provide dead bolts having a minimum throw of 3/4-inch with the effective throw of auxiliary deadlocking latches at least 3/8-inch.

Levers: Provide stainless steel screwless shank levers 4 inches long which have stainless steel escutcheon plates.

Door Closers: Provide closers with prime coated cast-iron casings and individual regulating valves for closing and latching control, including fully adjustable back-check control, and delayed action valve.

Provide closers meeting the requirements of BHMA A156.4, Grade 1.

Door Closer Type: Surface-apply door closers of the overhead liquid type with a full rack and pinion and in general apply away from finished areas and corridors by means of

parallel arms. Conceal surface-mounted closers with exterior cover boxes with sprayed DBL, SBL, US10, US26, US26D or US28 Finish.

Hold-Open Devices: Limit door swing with hold-open devices to where required. Hold-open devices shall be adjustable to any predetermined angle up to 90 degrees. Equip labeled doors with fusible links for hold-open arms, unless specifically prohibited by local codes.

Door Stops: Equip all doors with floor stop or doorstop and holders. Provide doors not equipped with closers or holders and which interfere with another door swing with a roller bumper.

Silencers: Mute all doors with metal frames with silencers, three door silencers for single doors and two door silencers for the head frame for double doors.

Closure Coordination: Assure inactive door closing before the active leaf with coordinating devices for double doors with overlapping astragal or rabbeted meeting stiles.

5A.18.4 Weatherstripping

Weatherstrip all exterior doors as follows:

- Head and Side Jambs
- Sills
- Astragals

5A.19 GLASS AND GLAZING

Provide the following physical properties:

- Daylight Transmittance: Visible - 19 percent.
- Reflectance: Visible Light - 14 percent.
- U Factor: 0.30 Btu/hr/sf/°F maximum.
- Shading Coefficient: 0.16.

5A.19.1 Codes and Standards

Minimum codes and standards:

- ASTM C 1036 - Flat Glass
- ASTM C 1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass

- ANSI Z97.1 - Glazing Materials used in Buildings
- ANSI Z97.1 - Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings
- ASTM D 1667 - Sponge Made from Closed-Cell Polyvinylchloride, or Copolymers Thereof
- Consumer Product Safety Commission, Part 1201, Safety Standard for Architectural Glazing Materials
- FS-DD-G-451D - Glass, Float or Plate Sheet, Figured (Flat, For Glazing Mirrors and Other Uses)
- FS-DD-G-1403C - Glass, Float, Sheet, Figured, Coated (Heat Strengthened and Tempered)
- FS-TT-S-00227E(3) - Sealing Compound, Elastomeric Type, Multi-Component (For Caulking, Sealing, and Glazing in Buildings and Other Types of Construction)
- Flat Glass Marketing Association (FGMA), Glazing Manual
- Commercial Practices, 16 CFR 1201, Architectural Glazing Material
- Report No. 104A (the Industries Technical Services Report): Cutting and Glazing

5A.19.2 Materials

General: Temper glass for safety glazing where shown and meet the material and location requirements of 16 CFR 1201.

Miscellaneous: Provide special elastic nondrying metal glazing compounds, sealants, tape and neoprene gaskets for aluminum windows and doors as recommended by the aluminum window and door manufacturer.

Glazing Tape: Polyisobutylene/butyl

Setting Blocks: Neoprene blocks, chemically compatible with sealant used.

Spacers: Neoprene blocks, 3 inches long, self-adhesive on one face only, chemically compatible with sealant used.

5A.20 GYPSUM WALL BOARD SYSTEMS

5A.20.1 Codes and Standards

Minimum codes and standards:

- ASTM C 36-- Gypsum Wallboard
- ASTM C 475 - Joint Treatment for Gypsum Wallboard Construction
- ASTM C 645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track, and Rigid Furring Channels for Screw Application of Gypsum Board
- Gypsum Association, GA-216 - Application and Finishing of Gypsum Board

5A.20.2 Materials

General: Provide gypsum wallboard materials meeting the following requirements.

Gypsum Wallboard: Provide gypsum wallboard of the tapered type, Sheetrock Regular 5/8-inch thick, 4 feet wide, and of lengths required. Provide 5/8-inch thick Sheetrock foiled back at exterior walls and Fire Code C for fire-rated gypsum wallboard.

Water-Resistant Gypsum Board: Provide 5/8-inch thick Sheetrock Water-Resistant Gypsum Panels for interior areas subject to moisture

Exterior Gypsum Board: Provide 5/8-inch thick Sheetrock exterior gypsum ceiling board for exterior ceilings and soffits.

Cement Board: Provide 1/2-inch thick Durock Cement Board as a backing for ceramic tile at furred and metal stud partitions and walls at shower stalls and other wet areas.

Metal Materials and Accessories: Provide metal materials and accessories that are galvanized.

Studs and Tracks: Provide 18-gauge steel studs and tracks.

Furring Channels and Clips: Provide hat type furring channels. Provide furring channel clips as recommended by the manufacturer to fasten furring channels to runners.

Screws and Fasteners: Provide coated drywall screws for attaching gypsum wallboard in lengths 3/8-inch greater than the total thickness of wallboard being fastened to the framing. Provide the size and type of screws for attaching metal doorframes and runners, metal trim and the like recommended by the gypsum wallboard manufacturer.

5A.21 CERAMIC TILE FLOOR AND WALL FINISH

5A.21.1 Codes and Standards

Minimum codes and standards:

- TCA - Tile Council of America, Inc.
- ANSI A108.1 - Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar
- ANSI A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
- ANSI A108.10 - Installation of Grout in Tile Work
- ANSI A118.1 - Dry-Set Portland Cement Mortar

- ANSI A118.6 - Ceramic Tile Grouts
- ANSI A137.1 - Ceramic Tile

5A.21.2 Materials

Ceramic Tile: Provide ceramic floor that is unglazed. Provide wall and base that is matte. Provide surface bull nose to finish the floor at finished openings. Provide tile in conformance with ANSI A137.1.

Bond Coat: Set the ceramic with dry-set mortar conforming to ANSI A118.1.

Grout: Provide latex Portland cement grout conforming to ANSI A118.6.

Expansion Joints: Form expansion joints with a material that will bond well to the tile and which will not soften at 140 degrees F or become stiff or hard at minus 30 degrees F. Match expansion joint color to the color of the grout.

5A.22 RESINOUS FLOORING

5A.22.1 Codes and Standards

Minimum codes and standards:

- ASTM C 307 - Test Method for Tensile Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings
- ASTM C 579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings
- ASTM D 905 - Test Methods for Strength Properties of Adhesive Bonds in Shear by Compression Loading
- ASTM C 109 - Test Method for Compressive Strength of Hydraulic Cement Mortars
- ASTM C 150 - Test Method for Portland Cement
- ASTM C 190 - Test Method for Tensile Strength of Hydraulic Cement Mortars
- ASTM C 321 - Test Method for Bond Strength of Chemical Resistant Mortars
- ASTM C 413 - Test Method for Absorption of Chemical Resistant Mortars, Grouts and Monolithic Surfacing
- ASTM C 580 - Test Method for Flexural Strength an Modulus of Elasticity of Chemical Resistant Mortars, Grouts and Monolithic Surfacing
- ASTM D 635 - Test Method for Rate of Burning and or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
- ASTM D 638 - Test Method for Tensile Properties of Plastics
- ASTM D 696 - Test for Coefficient of Linear Thermal Expansion of Plastics.
- ASTM D 790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

- ASTM D 1044 - Test Method for Resistance of Transparent Plastics to Surface Abrasion
- ASTM D 1308 - Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- ASTM D 2047 - Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces Measured by the James Machine
- ASTM D 2240 - Test Method for Rubber Property Durometer Hardness
- ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
- ASTM E 831 - Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis
- Military Specification MIL-3134F

5A.22.2 Performance Requirements

Install flooring to conform to the following:

Property	ASTM Test	Result
Tensile Strength	C 307	2,000 psi
Compressive Strength	C 579	9,000 psi
Bond Strength	D 905	300+ psi

5A.22.3 Materials

Provide jointless composition flooring and integral base surfacing of epoxy resin and homogenous mineral aggregate.

5A.23 ACOUSTICAL CEILINGS

5A.23.1 Codes and Standards

Minimum codes and standards:

- Acoustical and Insulating Materials Associations Performance Data, Architectural Acoustical Materials
- ASTM A 641 - Zinc Coated (Galvanized) Carbon Steel Wire
- ASTM C 423 - Methods of Test for Sound Absorption of Acoustical Materials in Reverberation Rooms
- ASTM C 523 - Methods of Test for Light Reflectance of Acoustical Materials by the Integrating Sphere Reflectometer
- ASTM C 635 - Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
- ASTM E 413 - Sound Transmission Class, Classification for Determination of

5A.23.2 Ceiling Units

Mineral Fiber Acoustical Panels: Provide units not less than 3/4-inch thick and of density not less than 10 pounds per cubic foot, medium-coarse non-directional texture, NRC 0.60 to 0.70, STC 35-39, light reflectance over 65 percent.

Provide washable plastic coating finish.

5A.23.3 Ceiling Suspension Materials

Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, Direct Hung.

Hanger Wires: Galvanized carbon steel, ASTM A 641, soft temper, prestretched, yield-stress load of at least three times design load, but not less than 12 gage.

Edge Moldings: Manufacturer's standard white baked enamel aluminum molding for penetrations of ceiling, with a single flange of molding exposed; "W" molding at edges.

Exposed Suspension System: Manufacturer's standard exposed runners, cross-runners and accessories, of the types and profiles recommended by the manufacturer to be compatible with acoustical panels specified and with exposed cross runners coped to lay flush with main runners.

Finish of Exposed Members: Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system including moldings, trim and accessories.

Finish: Manufacturer's standard baked enamel finish.

5A.24 PAINTING

5A.24.1 Codes and Standards

Minimum codes and standards:

- SSPC - Steel Structures Painting Manual
- SSPC SP 1 - Solvent Cleaning
- SSPC SP 3 - Power Tool Cleaning
- SSPC SP 6 - Commercial Blast Cleaning
- SSPC SP 10 - Near-White Blast Cleaning
- FS-TT-V-51F - Asphalt Varnish
- NSF 61 - Drinking Water System Components - Health Effects
- AWWA D102 - Standard for Painting Steel Water-Storage Tanks

5A.24.2 Materials

Provide surface preparation and painting of all new interior and exterior items and surfaces throughout the project. Types of products required include the following:

a. Amine catalyzed epoxies

b. Polyamine and polyamidoamine catalyzed epoxies

c. Fiberglass fiber reinforced polyamine and polyamidoamine catalyzed epoxies

d. Cycloaliphatic amine catalyzed epoxies

e. Homopolymer organic/inorganic oxirane capped thermosetting resins

f. Polyamide catalyzed epoxies

g. Waterborne, cementitious acrylics

h. Waterborne, styrenated acrylates

i. Aliphatic acrylic polyurethanes

j. Inorganic, zinc-rich ethyl silicates

k. Heat resistant silicones

l. Waterborne, vinyl and latex acrylics

m. Auxiliary materials and accessories

Provide compatible shop and field coats. Provide all coats of paint for any particular surface from the same manufacturer. Provide coatings, including paints, primers and materials in contact with potable water listed by NSF International under Standard 61. Provide a maximum of twelve different colors from manufacturers standard range of colors, in addition to color coding of all pipelines, valves, equipment, ducts and electrical conduit. Provide paint of City-approved color as selected from the manufacturer's standard range of colors.

5A.25 METAL LOUVERS

5A.25.1 Codes and Standards

Minimum codes and standards:

- AMCA 500 - Test Method for Louvers, Dampers, and Shutters
- ASTM B 221 - Specification for Aluminum-Alloy Extruded Bars, Rods, Wire Shapes and Tubes

- ASTM B 117 - Salt Spray (Fog) Testing
- ASTM D 523 - Specular Gloss
- ASTM D 659 - Evaluating Degree of Resistance to Chalking of Exterior Paints
- ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- ASTM D 1737 - Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus
- ASTM D 2244 - Color Differences of Opaque Materials
- ASTM D 2247 - Coated Metal Specimens at 100 Percent Relative Humidity

5A.25.2 System Performance

Provide louvers bearing the AMCA rating seal for air performance and water penetration ratings and meeting the following criteria:

- Minimum free area of 54 percent
- Free outside air intake velocity pressure drop at 1,025 feet per minute (FPM) not exceeding 0.15-inch wg.
- Water penetration not exceeding 0.02 ounces of water per square foot of free area at an airflow of 1300 FPM when tested for 15 minutes in accordance with AMCA Standard 500.

5A.25.3 Materials

Provide materials as follows:

Aluminum: Provide ASTM B 221, 6063 Alloy, T5 temper, extruded shape.

Fasteners and Anchors: Provide stainless steel fasteners and anchors.

5A.25.4 Accessories

Provide bird screens at ducted louvers of interwoven wire mesh of 0.063 inch diameter wire, 1/2-inch, square design, in a rewirable extruded aluminum frame. Provide insect screens at unducted louvers of 16 x 18 aluminum mesh, set in rewirable extruded aluminum frame.

5A.25.5 Fabrication

Provide louvers, louver houses, and louvered enclosures of welded construction, fabricated as follows:

- Louvered Enclosures: Provide louvered enclosures, including blades, blade supports, columns, angle supports, corner closures, and doors and frames, of welded construction.

- Louver Blade: Fabricate blades all of extruded aluminum, with a minimum material thickness of 12-gauge (0.081-inch), with integral water stops on the blade, welded to a frame, made to withstand 20 pounds per square foot wind load.
- Louver Frame: Provide channel shaped louver frames with a gutter, welded corner joints, with a material thickness of 8-gauge (0.125) inch extruded aluminum. Provide caulking stops for louvers installed in masonry openings.
- Mullions: Provide concealed intermediate supports for continuous blade appearance.
- Blank-Off Panels: Blank-off unused portions of louvers with insulated sheet aluminum laminated panels, consisting of an exterior facing of 0.040-inch thick sheet aluminum with a core of 1-inch thick expanded polyurethane and an interior face of 0.032-inch thick sheet aluminum laminated with an adhesive resistant to moisture and mildew. Finish panel edges with aluminum. Use panels in largest widths and lengths available.

5A.25.6 Finishes

Louvers, Louver Houses, Louver Enclosures: Finish aluminum surfaces, louver blades and frames in the manufacturer's standard Kynar 500 (NAAMM Class 1 AA-A42) finish. Finish below grade louvers in a clear NAAMM Class 1 AA-A41 anodic coating. Coordinate finishes of doors, windows, and louvers.

Screens: Finish the aluminum frame for screens in integral color to match the louvers.

Blankoff Panels: Finish exterior and interior sheet aluminum for blank-off panels in Kynar 500 National Association of Architectural Metal Manufacturers (NAAMM) Class 1 AA-A42) finish in color to match louvers.

5A.26 LOCKERS

Lockers: Provide lockable lockers of single door type, 18 inches wide 18 inches deep and 72 inches high with doors having top and bottom louvers for ventilation. Provide each locker with a polished aluminum number plate attached with split rivets and etched with black numerals.

Benches: Provide free standing benches with hardwood seats and enameled steel bases.

Finish: Finish lockers with the manufacturer's standard corrosion resistant primer and baked-on enamel in color as selected from the standard range of colors.

Finish seats of benches with the manufacturer's standard clear coating.

5A.27 TOILET ACCESSORIES

Provide toilet room accessories of Type 304 stainless steel. Provide tumbler locks for towel cabinets with the same keying for all accessory units. Provide three keys for each toilet room.

5A.28 WINDOW TREATMENT

Provide horizontal blinds with 1-inch wide aluminum slats and ladder type supports. Provide "U" shaped head and bottom rails of a minimum 0.024-inch thick steel. Cord, cord lock of steel construction and transparent tilt wand should be with self-lubricating nylon automatically disengaging worm and gear mechanism. Finish all exposed metal parts with the manufacturer's standard baked enamel finish in a color to match the slats.

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